

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

**UNITED STATES PATENT AND TRADEMARK OFFICE**

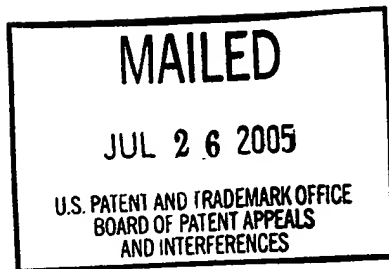
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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

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Ex parte BRADLEY S. WITHERS  
and  
BRENDA R. MENG

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Appeal No. 2005-1011  
Application No. 09/921,588

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HEARD: July 14, 2005

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Before FRANKFORT, PATE, and NASE, Administrative Patent Judges.  
NASE, Administrative Patent Judge.

**DECISION ON APPEAL**

This is a decision on appeal from the examiner's final rejection of claims 1 to 27 and 30 to 39, which are all of the claims pending in this application.

We REVERSE.

BACKGROUND

The appellants' invention generally relate to a method and apparatus for polishing a substrate in a chemical mechanical polishing system (specification, p. 1). A copy of the claims under appeal is set forth in the appendix to the appellants' brief.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Winebarger et al. (Winebarger)	5,433,650	July 18, 1995
Kimura et al. (Kimura)	5,679,063	Oct. 21, 1997
Nagahara et al. (Nagahara)	5,816,900	Oct. 6, 1998
Kennedy et al. (Kennedy)	6,139,406	Oct. 31, 2000

Claims 1 to 25, 30 to 33 and 35 to 39 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kimura in view of Nagahara.

Claims 26 and 27 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kimura in view of Nagahara as applied to claim 23 above, further in view of Winebarger.

Claim 34 stands rejected under 35 U.S.C. § 103 as being unpatentable over Kimura in view of Nagahara as applied to claim 31 above, further in view of Kennedy.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the final rejection (mailed June 25, 2003) and the answer (mailed February 24, 2004) for the examiner's complete reasoning in support of the rejections, and to the brief (filed December 1, 2003) and reply brief (filed April 23, 2004) for the appellants' arguments thereagainst.

#### OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the examiner. Upon evaluation of all the evidence before us, it is our conclusion that the evidence adduced by the examiner is insufficient to establish a prima facie case of obviousness with respect to the claims under appeal. Accordingly, we will not sustain the examiner's rejection of claims 1 to 27 and 30 to 39 under 35 U.S.C. § 103. Our reasoning for this determination follows.

In rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. See In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). A prima facie case of obviousness is

established by presenting evidence that the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the references before him to make the proposed combination or other modification. See In re Lintner, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972). Furthermore, the conclusion that the claimed subject matter is prima facie obvious must be supported by evidence, as shown by some objective teaching in the prior art or by knowledge generally available to one of ordinary skill in the art that would have led that individual to combine the relevant teachings of the references to arrive at the claimed invention. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Rejections based on 35 U.S.C. § 103 must rest on a factual basis with these facts being interpreted without hindsight reconstruction of the invention from the prior art. The examiner may not, because of doubt that the invention is patentable, resort to speculation, unfounded assumption or hindsight reconstruction to supply deficiencies in the factual basis for the rejection. See In re Warner, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967), cert. denied, 389 U.S. 1057 (1968). Our reviewing court has repeatedly cautioned against employing hindsight by using the appellants' disclosure as a blueprint to reconstruct the claimed invention from the isolated teachings of the prior art. See, e.g., Grain Processing Corp. v. American Maize-Products Co., 840 F.2d 902, 907, 5 USPQ2d 1788, 1792 (Fed. Cir. 1988).

With this as background, we analyze the prior art applied by the examiner in the rejection of the independent claims on appeal.

### **Kimura**

Kimura 's invention relates in general to a polishing apparatus, and more particularly to a polishing apparatus for producing a flat mirror polished surface on an object such as a semiconductor wafer. The object of Kimura's invention was to provide a polishing apparatus which can produce uniform polishing action across the polished surface of an object such as a semiconductor wafer so as to achieve a uniformly flat and mirror polished finish on the object. Kimura teaches that such object is achieved according to his invention by providing a polishing apparatus for polishing a surface of an object and including a turntable having a polishing cloth mounted on an upper surface thereof, a top ring for holding and pressing the object against the polishing cloth, and a plurality of radially arranged nozzles for supplying a polishing solution, containing abrasive material, of different concentrations differing along a radial direction of the polishing cloth.

According to a first embodiment of Kimura (see Figures 1-2), polishing solutions of different concentrations are supplied through the radially arranged nozzles disposed above the polishing cloth. Therefore, the apparatus allows fine tuning of the rate of

removal of the surface material of the object by adjusting the concentrations of the polishing solution at respective of the nozzles. The concentration of the polishing solution can be lowered in an area where the removal rate is high while the concentration of the polishing solution can be raised in an area where the removal rate is low. By providing an optimum distribution of concentrations of the polishing solution along a radial direction, Kimura teaches it is possible to improve the flatness of the wafer significantly.

According to a second embodiment of Kimura (see Figures 3-4) there is provided a polishing apparatus for polishing a surface of an object and including a turntable having a polishing cloth mounted on an upper surface thereof, a top ring for holding and pressing the object against the polishing cloth, at least one solution nozzle for supplying a polishing solution, containing abrasive material, having a common concentration, and a plurality of diluting liquid supply nozzles arranged in a radial direction for supplying adjustable volumes of diluting liquid so as to form a distribution of polishing solution of different concentrations by diluting the polishing solution with the diluting liquid on the polishing cloth. Each of the water supply nozzles is provided with a needle valve so that the volume of water supplied therefrom can be adjusted. By adjusting the volume of water delivered in the radial direction through each of the water supply nozzles, it is

possible to maintain a desired degree of dilution of the polishing solution on the polishing cloth.

Figure 8 shows a third embodiment of Kimura. In this embodiment, the apparatus is provided with a solution supply nozzle 19 for supplying solution supplied from a solution mixing unit 18, and a water supply nozzle 20 for supplying water containing a dispersion agent supplied from a dispersion agent mixing unit 17. In the dispersion agent mixing unit 17, any desired mixing ratio of a dispersion agent and water may be produced. Both the solution supply nozzle 19 and the water supply nozzle 20 are equipped with respective needle valves to enable adjustment of the supply volume. Therefore, by adjusting the degree of opening of the needle valve appropriately, the dispersion agent or polishing solution can be diluted to any desired concentration, and desired concentrations of the dispersion agent and the polishing solution can be retained on the polishing cloth. When the concentration of the dispersion agent is high, a uniformly polished wafer may be obtained using only two nozzles. However, while only two nozzles are illustrated, Kimura teaches that it is permissible to provide several nozzles as in the case of the second embodiment shown in Figures 3 and 4. Kimura provides that especially, when the concentration of dispersion agent is low, it is better to provide several radially arranged nozzles.

## **Nagahara**

Nagahara's invention relates to polishing in general and, more particularly, to a polishing apparatus for removing, with or without a polishing pad, material from a substrate (or wafer) surface at dissimilar rates depending on the polish position relative to the center of the wafer. Figure 1 provides a perspective view of a chemical mechanical polish (CMP) apparatus 10. Apparatus 10 includes a wetted polishing surface which can be adapted to bear against a semiconductor wafer 12. CMP apparatus 10 includes a polishing pad 16. Pad 16 allows a slurry mixture to be pumped directly through pad 16 according to arrows 18. The direction of fluid flow 18 is chosen such that it readily extends through pad 16 and impinges on wafer 12 at substantially perpendicular angles absent scattering as it traverses the pad.

Arranged on the bottom surface of pad 16 is a manifold 22. Manifold 22 contains a plurality of apertures which permit passage of fluid (i.e., slurry) through the apertures denoted as reference numerals 24. Apertures 24 receive the polishing fluid, and pass that fluid through pad 16 to the region between pad 16 and wafer 12.

Figure 2 illustrates in more detail along a cross-section of CMP apparatus 10. Apparatus 10 carefully and controllably places wafer 12 against pad 16 using a carrier



26 to retain wafer 12 and a housing 28 to retain pad 16. Carrier 26 is used to rotate wafer 12 against pad 16 which is directed upward against the wafer during polishing. Housing 28 serves somewhat the same purpose as carrier 26 in that it retains pad 16. Pad 16 and housing 28 form a chamber which can receive air pressure 40 through an inlet port 42. Placed between pad 16 and chamber 44 is manifold 22 having a plurality of apertures 24.

The air pressure and/or fluid extending through inlet port 42 causes manifold 22 and pad 16 to extend upward. In so doing, manifold 22 may flex in an arcuate pattern as shown. Uneven pressure may result in a relatively severe, circular polishing pattern near the center of wafer 12. The circular polishing pattern at or near the center is dictated by the length of oscillation vectors 20. Abrasion primarily at the center region will not produce a desired uniformity across the entire wafer surface. Alternatively, polish only at the center may not remove thicker films which may not exist at the perimeter of the wafer, due to uneven chemical vapor deposition (CVD) or sputter deposition techniques.

To offset the uneven nature by which pad 16 might abrade wafer 12 surface, uneven delivery of slurry may be desired. The uneven fluid delivery is shown as reference numeral 48, where the length of arrows indicate a greater channeling of fluid

flow and pressure to the outer perimeter of pad 16 relative to the center of pad 16. The result of uneven fluid delivery is to accumulate more fluid (or slurry) at the perimeter of the wafer rather than at the center to offset possibly greater abrasive force of an arcuate pad applied at the center as shown. It is believed that by directing slurry with sufficient force at the out perimeter of the wafer, more wafer will be removed at those perimeter positions and relatively little slurry forwarded at the center of the wafer. The fluid delivery non-uniformity is shown in Figure 2 to offset the abrasive pad-wafer contact nonuniformity.

Figure 3 illustrates instances where pad 16 may not necessarily bow upward if minimal polish pressure is applied through pad 16. This is contrary to that shown in Figure 2. Instead, pad 16 maintains a relatively planar upper surface when brought to bear against a wafer. It might be desirable in many instances to apply more fluid to the center of the wafer than at the perimeter. Vectors 50 illustrate fluid flow and pressure differentials. The fluid flow and pressure differentials may be selected to remove more surface material at the center of the wafer, with gradual decrease as radial position extends to the perimeter of the wafer.

**Claims 1 to 25, 30 to 33 and 35 to 39**

We will not sustain the rejection of claims 1 to 25, 30 to 33 and 35 to 39 under 35 U.S.C. § 103 as being unpatentable over Kimura in view of Nagahara.

In this rejection (final rejection, pp. 2-3), the examiner ascertained that Kimura discloses all the limitations of the independent claims under appeal (i.e., claims 1, 16, 19, 23, 30 and 31) except for delivering polishing fluid with the same concentration dispensed at different rates at different regions. The examiner then concluded that:

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the system of Kimura et al. by delivering polishing fluids having the same concentration at varying rates to different regions as taught by Nagahara et al. to adapt the system for removing film material at dissimilar rates to offset films which have previously accumulated at dissimilar thicknesses across the wafer, (Nagahara et al. col. 2, lines 8-16).

The appellants argue throughout the briefs that there is no motivation in the applied prior art to combine the Kimura and Nagahara so as to arrive at the claimed subject matter. We agree. In that regard, we view the teachings of Kimura and Nagahara of how to deliver polishing fluid to be so disparate that a person having ordinary skill in the art at the time the invention was made would not have modified Kimura in the manner set forth in this rejection.

In our view, the only suggestion for modifying Kimura in the manner proposed by the examiner to arrive at the claimed invention stems from hindsight knowledge derived from the appellants' own disclosure. The use of such hindsight knowledge to support an obviousness rejection under 35 U.S.C. § 103 is, of course, impermissible. See, for example, W. L. Gore and Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

For the reasons set forth above, the decision of the examiner to reject claims 1 to 25, 30 to 33 and 35 to 39 under 35 U.S.C. § 103 as being unpatentable over Kimura in view of Nagahara is reversed.

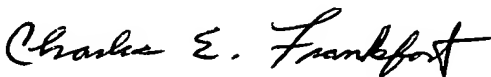
#### **Claims 26, 27 and 34**

We have reviewed the references to Winebarger and Kennedy additionally applied in the rejection of claims 26, 27 and 34 but find nothing therein which makes up for the deficiencies of Kimura and Nagahara discussed above. Accordingly, the decision of the examiner to reject claims 26, 27 and 34 under 35 U.S.C. § 103 is reversed.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1 to 27 and 30 to 39 under 35 U.S.C. § 103 is reversed.

REVERSED



CHARLES E. FRANKFORT  
Administrative Patent Judge



WILLIAM F. PATE III  
Administrative Patent Judge



JEFFREY V. NASE  
Administrative Patent Judge

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